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(54) **Data entry system.**

(57) In a transaction terminal, a credit card reader is used not only to enter data from cards of customers, but a special card is used to place the terminal in supervisory modes in at least one of which it will accept data from further special cards which are used to input data used in the transaction mode, particularly alphanumeric data for printing on transcation slips. The terminal has a customer accessible auxiliary keyboard which may be used for data entry, at a location remote from the main unit, allowing for point of sale data entry, including private entry of a customer's Personal Identification Number, either to validate a transaction or during selection of a PIN for encryption by the terminal. Data captured by the auxiliary keyboard is only retained for so long as a customer's card resides in a slot in the auxiliary keyboard, and PIN numbers are encoded as part of a sequence in which data is downloaded to the main unit.
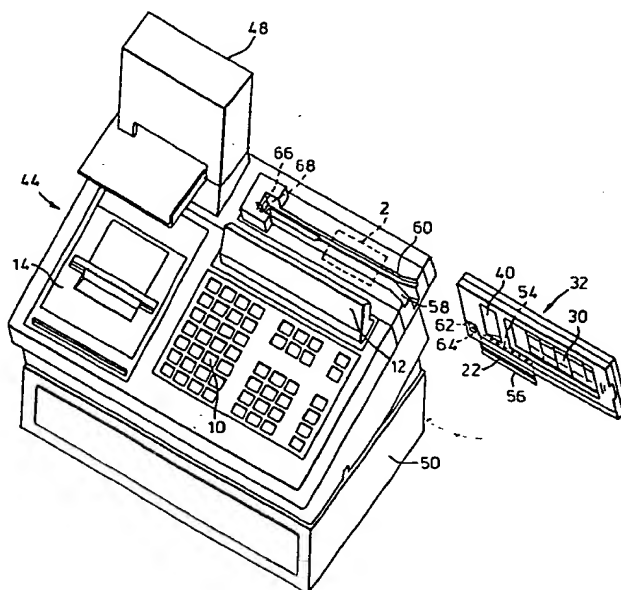
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DATA ENTRY SYSTEM

This invention relates to data entry terminals, and more especially point of sale or transaction data entry terminals capable of handling credit card transactions.

Of recent years, there has been an increasing use of
5   credit cards carrying machine readable coding identifying the cardholder's account and including further relevant information, including, in an encoded form, a Personal Identification Number, or PIN, known to the cardholder but not appearing on the card in human readable form.
10   Entry by a cardholder of his PIN in a machine equipped to read the encoded information of the card may be used to confirm a transaction in place of the usual requirement of a signed authorization. Although various systems have been developed for storing the encoded information, the
15   currently preferred system utilizes a magnetically striped card carrying two parallel tracks, the information in at least one track (Track 1) being a standardized (ANSI X9.8) format. This in turn facilitates the use of standardized credit card readers. Standards have also been developed
20   for communicating and encrypting data exchanged between data entry terminals and host computers.

Systems have also been developed which will accept data from more than one class of card.

U.S. Patent No. 4,532,416 discloses a system providing

simplified operation of a data entry terminal equipped with
a credit card reader. Although specifically described with
reference to a unit adapted to read ANSI standard encoded
magnetic stripe cards, the operation of the invention is
5   not dependent upon the technique utilized to store infor-
mation on or in the card, provided that such information
is machine readable and a suitable reader is incorporated
in the unit.

In order to facilitate confirmation of credit card
10   transactions using a terminal equipped with a credit card
reader, it is very desirable that facilities be provided
for entry of a customer's PIN so as to enable transactions
to be verified without obtaining the customer's signature
on an imprinted sales slip. In an application of a ter-
15   minal such as at a full service filling station, a conven-
tional credit card transaction involves multiple trips of
an attendant between the customer's vehicle and an office
which may be some distance away, over a route which will
be more or less exposed to the elements and may be crowded
20   with vehicles and equipment. In order for use of the PIN
to be really practicable, facilities must be provided for
customer entry of the PIN under circumstances which en-
able the customer to enter the number in privacy.

According to the invention, a transaction terminal com-
25   prises a reader to read data from suitably encoded credit
cards, a main keyboard, a main display for displaying
information including data entered through the keyboard,
a printer, a data processor receiving data from said
reader and at least one keyboard, and a program memory
30   containing selectable programs for operating said terminal
in a plurality of modes in which it receives data from
said credit card reader, wherein the terminal further in-
cludes a portable keyboard detachable from the remainder
of the terminal and operable when detached to receive a

data entry required as part of a transaction at a point remote from the remainder of the terminal and operable to transfer it to the processor independently of the main keyboard and display when reunited with the remainder of the terminal, wherein the portable keyboard unit comprises a memory, a power supply, control logic operative to store keyboard entries in the memory, and an interface to transfer data from the memory to the remainder of the terminal when the keyboard unit is united with the remainder of the terminal, and wherein the portable keyboard unit further includes means to engage a credit card so as to present an encoded portion of the card for reading by said reader, and the unit is united with the terminal for transfer of data when a card is so presented.

This means is provided in a preferred embodiment of the present invention by providing a slot in the portable keyboard to receive and enclose a customer's card apart from that portion carrying machine readable data, and switch means responsive to the presence of a card in the slot and permitting retention of data entries only for so long as the card remains in the slot. Preferably also the portable keyboard incorporates a data encryptor operative to encode a PIN prior to its transfer to the remainder of the terminal.

With this arrangement, the portable keyboard can be taken to the customer for PIN entry, without the entry appearing on the main display or the customer requiring access to the main terminal keyboard. Moreover, by making use of the facilities required in any case for encrypting a PIN entered by a customer, the issue of new credit cards can be facilitated. Thus the terminal can encrypt a number selected by the customer, and output the code in whatever manner suits the procedure adopted by the card issuer. This avoids the necessity of the customer either having to visit a central office to select a PIN, or to disclose

the PIN to local staff, yet requires no additional hard-ware at the terminal.

Further features of the invention will become apparent from the following description of a preferred embodiment
5   of the invention, taken in conjunction with the accompany-ing drawings.

Figure 1 is a block schematic diagram of a terminal in accordance with the invention;

Figure 2A illustrates a supervisory card that may be
10 employed in conjunction with the terminal;

Figure 2B illustrates a product card that may be employed in conjunction with the terminal;

Figure 2C illustrates a station identification card that may be employed in conjunction with the terminal; and

15 Figure 2D illustrates a message card that may be employed in conjunction with the terminal.

Figure 3 is a more detailed block schematic diagram of an embodiment of the portable keyboard unit;

Figure 4 is a more detailed block schematic of those
20 portions of the main terminal unit directly cooperating with the portable keyboard unit; and

Figure 5 is a perspective view illustrating the physical interaction of the portable keyboard unit and the main
25 terminal unit.

Referring to Figure 1, the general arrangement shown is little different from known transaction data entry termi-nals incorporating a card reader 2. The card reader is

typically an ANSI standard Track 1 manual swipe magnetic
card reader, although it will be understood that the card
reader will be selected to be appropriate to the type and
encoding of the cards to be utilized. It may also incor-
5   porate means for updating the encoded information on the
card. Except as further described below, the construction
and functioning of the card reader and its interfacing
with a processor 4 form no part of the invention, provided
that it is capable of recovering data from a card present-
10   ed to the reader and transferring it to the processor, the
latter having a memory including read only memory 6 and
random access memory 8. The processor is provided with
various conventional peripherals such as a data entry key-
board 10, a data display 12, a printer 14, and a modem 16
15   through which it can communicate with a host computer.

Other than from the host computer, and an auxiliary key-
board whose function is described further below, data can
be entered into the processor only from the keyboard 10
and the card reader 2. A difference from known terminals
20   is that certain types of keyboard entry are replaced by
data entered by means of special categories of cards,
other than the usual customer cards, cards of which speci-
al categories form an integral part of the system. These
cards are similarly constructed to conventional customer
25   cards, but will carry some visual identification so as to
enable differentiation by an operator. Cards bearing
examples of such identifications are shown in Figures 2A
to 2D. These cards carry codes which can be read by the
reader 2, and which replace keyboard data entries utilized
30   in conventional terminals. The function and construction
of the processor can be otherwise identical to that of a
conventional reader equipped terminal, except for changes
in the programming stored in the ROM 6 to enable the pro-
cessor to accept the appropriate codes from the card
35   reader rather than the keyboard, and to prompt card
rather than keyboard entries where appropriate. Such
changes are well within the scope of ordinary programming
skills and since they will in any case be dependent upon

the nature of the remainder of the programming of the
processor they will not be described in detail.

The first of the cards to be considered is the supervisory
card 20 shown in Figure 2A. In a practical transaction
5   terminal, various modes of operation are desirable in ad-
dition to the normal mode in which details of transactions
are entered and stored and receipts or other transaction
records printed. These modes are known generally as
supervisory modes. Thus one such mode provides for carry-
10   ing out reconciliation totals. Other modes provide for
alteration of data stored in the memory 8 in the unit,
other than by ordinary transactions. A supervisory card
may be utilized to enter a code from its magnetic stripe
22 which conditions the unit to accept a further keyboard
15   entry selecting a particular supervisory mode. A particu-
lar supervisory card may have a code permitting access to
all supervisory modes, or only selected modes, or even
only a single mode. Such supervisory modes may include a
reconciliation mode as mentioned above, a test mode for
20   verifying proper operation of the unit, and various data
entry modes. In at least certain of those data entry
modes, data entry is at least in part by means of further
data entry cards of which exemplary cards 24, 26, 28 are
shown in Figures 2B, 2C and 2D.

25   The product cards 24 are utilized when the unit is in a
product entry mode. Thus the unit may be programmed to
store data (identification, price, or unit price) concern-
ing a number, for example 10, of different products. This
data may be changed by using a supervisory card followed
30   by a single digit keyboard entry to select the product
entry mode and then keying in the product number, which
will prompt the unit to show on the display a request for
entry of a product card. This card will identify a pro-
duct and will prompt the unit to display the product iden-
35   tification and other data appropriate to the product such

as a unit price. This other data may then be cleared and replaced by keyboard entry so as to establish a new unit price. In some cases, no additional data is required by the machine, and the card is merely used to establish the

5   product or category of product to which a particular product number relates and to enter the appropriate data from the card into the memory 8. The unit may be programmed so that making an entry without a product number will produce a prompt for a request to print out on printer 14 a list

10   of the product data stored by the terminal under each product number, which list may be placed on the terminal or elsewhere for reference by the operator.

Further cards may be utilized in the supervisory modes whenever it is necessary to enter alphabetic or alpha-

15   numeric information which can conveniently be stored in the relatively permanent format of a coded card. Thus in a further supervisory mode entered by an appropriate keyboard entry after use of an appropriate supervisory card 20, the name, address and telephone number of an estab-

20   lishment such as a service station at which the terminal is located may be entered by inserting, upon display of the appropriate prompt, a station identification card 26, which carries the appropriate data together with a code identifying it as data to be printed at the head of every

25   receipt or other message printed by the printer 14.

In effect, the data entry cards provide the text of alphanumeric messages to be displayed or printed by the terminal during use, and which need to be capable of local alteration.

30   Similarly, in yet a further supervisory mode selected by appropriate keyboard entry following use of a supervisory card 20, an end-of-receipt message such as "Drive Carefully" (together with suitable code identifying it as such) may be entered using a message card 28. Use of such

cards means that a local operator can program the terminal
with appropriate alphabetic or alphanumeric data for in-
clusion in receipts and messages to be printed by the
printer 14, quickly and without the terminal requiring an

5   alphanumeric keyboard, since all necessary keyboard
entries may be made using a numeric keyboard, with a mini-
mal number of additional function keys. Basically, only
"Clear" and "Enter" keys are required in addition to
numeric keys, but it will usually be convenient to include

10   extra function keys such as "Credit to Account", "Back
Step" (to correct mistakes in entry), "Cash" (to indicate
a cash transaction and thus enable data entries to be made
without prior reading of a customer card), and "Total".

All of these functions as well as the numerals 0 - 9 may

15   be accommodated on a 4x4 key matrix, which not only saves
cost but may also be much smaller than an alphanumeric
keyboard. Furthermore, it means that the keyboard may
readily be duplicated to provide additional portable key-
board units which may be handed to a customer at a point

20   of sale such as a service station fuel pump. In its
simplest form such a portable keyboard 30 may be connected
to the rest of the terminal by a flexible cable, but in a
preferred arrangement a portable keyboard is provided
which forms part of a unit 32 which is wholly separable

25   from the terminal, and comprises the keyboard 30, which
is similar to the keyboard 10 but may have less function
keys, a memory 34 organized to store data entered by suc-
cessive key strokes, under the control of control logic
38, an optional display 40 to display the numbered entered

30   during entry, again under control of the logic 38, and a
battery 36 to power the unit. When the unit 32 is plugged
into the terminal by means of an interconnect 42, the
memory is read under control of the processor 4 and the
stored sequence of numbers accepted in place of an entry

35   from the keyboard 10. Means may be provided to recharge
the battery 36 while the unit is plugged in. In order to

avoid a reliability problem associated with physical
contacts, the interconnect 42 may be established by induc-
tive coupling, or in the embodiment described further
below, infrared coupling.

5   The advantages of including such an auxiliary keyboard
which can be taken to a customer are several, and may be
illustrated by considering an application of the terminal
in a full service filling station. Normally speaking, a
conventional credit card transaction in such a station re-
10   quires an attendant to take a customer's card, go to an
office to fill out and imprint a sales slip, and carry
out any necessary verification and authorization procedures
and return to the vehicle with the sales slip to obtain
the customer's signature. It is necessary to have avail-
15   able both a writing implement and something upon which to
support the sales slip during signature, and copies of the
sales slip must subsequently be returned to the office. A
considerable amount of manipulation is required on the
part of the attendant, which slows down operation particu-
20   larly under bad weather conditions. When using an auxili-
ary keyboard unit 32, the attendant hands the unit to the
customer who enters a PIN, and then takes both the unit
and the customer's card to the office where the remainder
of the terminal is located. The unit 32 is then again
25   plugged into the terminal and downloads the data it con-
tains (including in this case the PIN number), and the
card is passed through the reader 2 as part of a normal
transaction sequence. Assuming that the sequence proceeds
normally, the terminal will print a transaction slip which
30   is returned to the customer with the card to complete the
transaction. Clearly, the amount of manipulation required
by the attendant is greatly reduced, and neither attendant
nor customer is required to write anything. If the custo-
mer comes to the office, a cable connected portable key-
35   board 30 may be handed to the customer for entry of the
customer's PIN.

When the portable keyboard unit is wholly separable from
the main terminal, then the terminal processor cannot
prompt for entries in the normal way. In this case, data
can be entered by entering codes denoting the type of data,
5   followed by the data itself. When the data is downloaded
from the keyboard unit memory 34 into the terminal memory
8, the codes associated with the data identify it so that
it can be utilized by the terminal at an appropriate point
in a data acquisition sequence in place of data entered
10   through the main keyboard 10. In a first embodiment of
keyboard unit, an appropriate code entered by an operator
before handing the unit to a customer for PIN entry not
only identifies the entry as a PIN but instructs the ter-
minal not to display or print out the PIN. The control
15   logic 38 of the unit is configured so that, at least in
the case of a PIN entry, completion of the entry by strik-
ing an enter key removes the entry from the display 40
(if provided) and it is thereafter prevented from being
displayed either on the display 40 or the display 12, or
20   printed out on the printer 14. The unit may, if a display
40 is provided, also be utilized by the operator to enter
and display a total amount of a billing to be authorized
which can be shown to the customer before handing over the
unit for entry of the PIN. On return of the unit to the
25   remainder of the terminal, a check can be made that the
total authorized agrees with that arrived at by the termi-
nal itself, before the transaction sequence is completed
and a transaction slip printed. The PIN is also encrypted
by an encryptor 18, which may be implemented by a commer-
30   cially available data encryption unit such as the Intel
(Trade Mark) 8294. Such an encryption unit, when supplied
with an appropriate encryption code and data to be encoded
will encode the data according to the Federal Information
Processing data encryption standard using the National
35   Bureau of Standards encryption algorithm. The encrypted
PIN is compared with the encrypted PIN read from the cus-
tomer's card by the reader to confirm the transaction.

This capability of allowing a customer to enter a PIN with privacy, and the fact that the terminal already includes the encryptor 18, also facilitates inclusion of a further customer service, by which a customer applying for a

5   credit card is enabled to select a PIN of the customer's choice. A supervisory card 20 is used, followed by a numerical keyboard entry through the keyboard 10 to place the terminal in an encryption mode in which an encryption program is enabled. When a customer's credit

10   card application is approved, the customer is informed of the account number. The customer enters first the account number, and then keys in a selected four digit number on the appropriately enabled portable keyboard 30. In practice it will be convenient to have the customer key in the

15   four digit number twice, to provide confirmation and to produce an eight digit number, and then press the enter key which clears the display 40 (if provided) and transfers the number to the memory 34. When the keyboard unit 32 is plugged into the main terminal and downloads the

20   memorized number, the encryption program encrypts the number to provide a code which can be forwarded to central office with other data from the terminal via the modem 16. If a cable connected keyboard unit 30 is used, then the customer must be asked to enter the PIN when the appropri-

25   ate prompt appears on the display 12. It will be understood that the actual procedure used may be varied to suit circumstances and security requirements, the important feature being that the presence at one terminal of both an encryption unit and a keyboard, separate from but

30   communicating with the main terminal, enables PIN number selection to be carried out at the terminal in a secure manner. Improved security and ease of use is obtained using the embodiment of the portable unit described below with reference to Figures 3 to 5.

35   A further advantage of the separable unit 32 is that it can be used for data acquisition whilst leaving the

remainder of the terminal free for dealing with other
transactions. Indeed, it is possible to equip each atten-
dant with a unit 32 whilst having only a single terminal
or at any rate only as many terminals as are required to
5   handle the required transactions.

Supervisory cards 20 can also be utilized to place the
terminal in other supervisory modes, selected by suitable
keyboard entries after reading of a card 20. These modes
can include a diagnostic mode in which the functions of
10 the terminal can be tested by suitable keyboard entries.
Other modes enable a calendar clock function provided by
the processor 4 to be checked or reset so that the correct
date and time is printed on receipts by the printer 14,
enable entries to be made ensuring the application of local
15 tax rates, enable entries to be made in respect of cash
added or removed from a cash drawer other than in the
course of a transaction, and enable entries to be made to
set authorization limits for credit transactions so that
an operator is notified of an authorization requirement
20 where necessary. It should be understood that such facili-
ties are already known in electronic cash registers and
transaction terminals and that the programming and elec-
tronic components of the system as a whole can follow con-
ventional lines, except for minor alterations to the
25 programming to enable the terminal to accept certain data
from the card reader in place of or alternatively to the
keyboard. This permits use of a simplified keyboard, simp-
lifies operation, and improves control of access to the
supervisory function. The simplified keyboard also simp-
30 lifies provision of a portable keyboard as already
described, which in turn makes it more practical to con-
firm transactions by entry of a customer's PIN.

Referring to Figures 3 to 5, a preferred embodiment of
portable keyboard is shown in more detail, and includes
35 features to improve the security of transactions.

Figure 5 shows an exemplary form of transaction terminal in accordance with the invention, consisting of a main terminal unit 44, and the portable keyboard unit or PIN pad 32. The main terminal unit presents conventional

5 features of a transaction terminal such as the keyboard 10, the printer 14, and the display 12, as well as a sales slip imprinter 48 and a cash drawer 50. The card reader 2 is located within a special housing 52 described further below and designed to interact with the unit 32.

10 The PIN pad unit 32 incorporates all of the components described with reference to Figure 1, of which the display 40 and auxiliary keyboard or keypad 30 are visible in Figure 5. The housing of the pad is formed with a slot 54 to receive a customer's credit card 56 in such a manner

15 that a portion of the card carrying the magnetically coded stripe 22 remains projecting from the slot, whilst the human readable characters representing the cardholder's name and number are hidden within the slot. Within the slot is a switch 57 (see Figure 3) which is held closed

20 for so long as a card remains fully inserted in the slot. When the lower (as seen in the drawing) edge of the PIN pad is moved from the right (as shown) into a track 58 defined in the housing 52, the projecting portion of the card 56 is guided into a slit 60 wherein it is scanned by

25 the card reader 2. Additionally, the housing 52 guides the unit 32 so that as it approaches the end of the track 58, an infrared emitting diode comprised by an infrared transmitter 62, and an infrared sensitive phototransistor comprised by an infrared receiver 64, both in the unit 32,

30 are optically aligned with an infrared receiver 66 and transmitter 68 within an enclosure at the end of the track 58. These transmitters and receivers together con- stitute the interconnect 42 of Figure 2.

Referring to Figure 3, the control logic 38 and memory 34
35 of the unit 32 are combined into a microcomputer 70, for

example a 146805G2 microcomputer chip from Motorola, which
is a CMOS version of the 6805 microcomputer chip incorpor-
ating a microprocessor, random access memory, erasable
programmable read only memory, and thirty-two lines prog-
5   rammable as inputs or outputs from or to various peripher-
als. Eight of those lines, programmed as four inputs and
four outputs, are used to poll the keyboard 30, and a
further seven programmed as outputs, drive the liquid
crystal display 40. A further four, programmed as inputs,
10   are selectively jumpered high or low by an I.D. block 72
so as to provide an identification signal identifying the
unit 32 in the event that several such units are employed
at one location. A further line, programmed as an output,
drives the infrared transmitter 62, and yet a further line,
15   programmed as an input drives a buzzer 74 under control of
a subroutine providing audible indication of the entry of
a character through the keyboard 30, or of a low battery
condition as detected by a battery level detector circuit
76 polled using a further input and a further output line.

20   The microprocessor is powered directly by a battery 78,
but all those peripherals which consume power, including
pull-up resistors (not shown) for the keyboard, receive
power via the switch 57, and in the case of the display
40 via a voltage doubler circuit 80. Power transmitted
25   via the switch 57 also maintains a reset circuit 82 in a
disabled condition, such that a $\overline{\text{RESET}}$ input of the micro-
computer 70 is held high, thus enabling the latter. An
optional thermostatically controlled heater element 84 is
provided behind the display 40, to ensure proper function-
30   ing of the display in the event that the unit has to be
used in very low ambient temperatures.

Figure 4 is a block diagram of a portion of the circuit of
the main terminal unit 44. The card reader 2 has separate
heads serially reading data in upper and lower tracks of
35   the stripe 22, from which it recovers serial digital data

streams and clock signals which are converted to parallel data by means of USARTs 86 and 88 and applied to data bus 90 of the terminal. Similarly, the receiver 66 and trans-mitter 68 are linked to the bus 90 by a further USART 92,

5 as is a data encryptor/decryptor unit 94. These functions may be implemented by readily available chips such as the 8251A for the USARTs and the 8294 for the encryptor/decryptor.

In use, the unit 32 remains in a dormant condition, with

10 only the microcomputer 70 powered up, until a credit card is inserted in the slot 54 so as to close the switch 57, activate the peripherals and pull the $\overline{\text{RESET}}$ line high. Removal of the card will power down the peripherals and insertion will reset the computer, causing an initializa-

15 tion routine to clear and reinitialize those portions of the random access memory of the computer used for storing data entered from the keyboard. Other portions of memory are retained, and for this reason the switch 57 is not operative to cut off power to the microcomputer 70. Hence

20 the unit can only receive data via the keyboard and trans-fer it to the main unit 44 provided that a credit card remains continuously in the slot 54 throughout the process.

Before a unit 32 is put into use, it must be validated by inserting an appropriately coded supervisory card 20 in

25 the slot 54 which initializes the microcomputer 70 as described above. The unit with the card 20 is then moved through the track 58 on the main unit 44 so that the mag-netic stripe 22 on the card is swiped through the card reader 2. This places the terminal in a supervisory mode

30 in which it first uses the interface 42, as described further below, to pass a command to the unit 32 requiring it to send back, via the interface 42, its identification code as set by its ID block 72. The unit 44 logs in the unit 32 so that data subsequently received from a unit

35 with that identification code will be recognized, and

transmits a further enabling code to the unit 32 which enables its keyboard to accept entries, provided of course that a card is in the slot 54. This enabling code, together with any other validation codes or data, it may be
5   deemed to transmit to and retain in the unit 32 for subsequent use, is stored in portions of the unit's random access memory which are not cleared by the initialization routine that occurs on reset.

    In one mode of use, for example in connection with a sale
10   of gasoline at a full service filling station, an attendant takes a customer's credit card, places it in the slot 54 in a unit 32 which has been validated as described above and issued to the attendant, thus resetting and initializing the microcomputer 70, and presses a START key
15   provided on the keyboard 30. This initiates a routine which first causes the display 40 to exhibit a prompt such as "ENTER AMOUNT" and initiates a keyboard polling routine to permit keyboard entries from a numeric pad which are entered on the display. When the entry is completed, the
20   unit with the displayed amount is handed to the customer for verification. The customer confirms the transaction total so entered by pressing an ENTER key which causes transfer of the amount from a keyboard register into a storage register provided in the random access memory of
25   the microcomputer. A prompt such as "ENTER PIN" is then exhibited on the display, and the customer then enters the PIN number associated with the card inserted in the unit, completing the entry by use of an entry key. The microcomputer is programmed so that during this entry a charac-
30   ter such as an asterisk is entered on the display 40, rather than the actual character entered, thus preserving security.

    After successful entry of the above discussed two items of data, the unit 32 with the credit card still inserted is
35   taken to the main terminal unit 44 where its lower edge

is moved through the track 58 so as to swipe the magnetic
stripe 22 of the card 56 through the card reader 2. The
data read from the card by the reader is converted from
serial to parallel from the USARTs 86, 88 and applied to
5   the data bus 90 of the processor 4 (see Figure 1) under
the control of signals on a control and address bus 96.
Likewise, data is transferred between the unit 44 and the
unit 32 through the interface 42 using essentially conven-
tional serial communication protocols. In practice, since
10   microcomputer 70 receives incoming serial data from the
receiver 64 via its interrupt line, the transfer of data
from the unit 44 takes control of the microcomputer 70 and
causes it to accept commands and data from unit 44. Typic-
ally, the unit 44, after verifying the identity of the
15   unit 32, transmits to the unit 32 a command to encrypt the
PIN which it holds in its memory, using a working key
which has been derived by the encryptor/decryptor unit 94
from the data read from the customer's card 56 using a
master key programmed in the unit 44, in accordance with
20   the procedures laid down in ANSI standard X9.8. Using the
working key supplied to the unit 32 via the interface 42,
the PIN stored in a register set up in the microcomputer
random access memory is then encrypted. The encryption
is again preferably in accordance with the data encryption
25   algorithm specified in ANSI standard X9.8 and provides a
PIN data block configured in accordance with that standard,
which is transmitted to the unit 44 via interface 42,
together with data as to the transaction total. Since the
amount of data to be transferred is normally not large, a
30   data transfer rate of 1200 baud enables normal transfers
to be completed in a fraction of a second. Successful
completion of a transfer can be signalled by means of an
audible or visible signal provided by the unit 44.

It will be appreciated that the foregoing description
35   provides only a basic outline of one important mode of
use of the apparatus. It will be appreciated that the

data entry sequence can be extended to prompt for the
entry of additional data, such as product type or quantity
involved in the transaction, vehicle registration numbers
and so on. In order to cope with operator or customer

5   errors, routines are provided to clear and re-enter errone-
ous entries, and to provide audible signals from the buzzer
74 where this will facilitate operation. Subroutines
appropriate for execution of all these conventional data
entry and transfer functions will be familiar to those

10 accustomed to programming microcomputers such as the 6805,
and will not be described in detail.

It will also be appreciated that different or alternative
modes of use may be appropriate according to the environ-
ment in which the system is utilized, and the manner in

15 which a transaction is entered, and microcomputer 70 may
be programmed accordingly. It may be desired to enter
transaction data via the main unit 44, which may for ex-
ample be interfaced with a fuel pump control console from
which it receives transaction data directly. In this

20 case, the unit 32, loaded with the customer's card, may be
swiped through the track 58 to enable the card data to be
read, and to receive transaction data from the unit 44.
This transaction data can then be verified by the custo-
mer, and a PIN entered as before, after which a further

25 swipe of the unit 32 through the unit 44 is required to
encode and download the PIN and confirm the transaction.

It will be appreciated that the PIN is never transferred
or displayed in unencoded form, and thus a high degree of
security can be maintained. The PIN can only be retained

30 in the unit 32 for so long as the card 56 remains present.
Removal of the card will disable the microcomputer by
pulling the RESET line low and disabling the peripherals
to render the data inaccessible, and substitution of
another card will re-initialize the microcomputer and des-
troy the data. The body of the unit 32 is preferably

constructed so that any attempt at disassembly will open the switch 5,7 and thus have the same effect as removing the card.

CLAIMS:

1. A transaction terminal comprising a reader to read data from suitably encoded credit cards, a main keyboard, a main display for displaying information including data entered through the keyboard, a printer, a data processor receiving data from said reader and at least one keyboard, and a program memory containing selectable programs for operating said terminal in a plurality of modes in which it receives data from said credit card reader, wherein the terminal further includes a portable keyboard detachable from the remainder of the terminal and operable when detached to receive a data entry required as part of a transaction at a point remote from the remainder of the terminal and operable to transfer it to the processor independently of the main keyboard and display when reunited with the remainder of the terminal, wherein the portable keyboard unit comprises a memory, a power supply, control logic operative to store keyboard entries in the memory, and an interface to transfer data from the memory to the remainder of the terminal when the keyboard unit is united with the remainder of the terminal, and characterized in that the portable keyboard unit (32) further includes means (54) to engage a credit card (56) so as to present an encoded portion (22) of the card for reading by said reader (2), and the unit (32) is united with the terminal (44) for transfer of data when a card (56) is so presented.

2. A terminal according to Claim 1, characterized in that it comprises means to guide the portable keyboard unit (32) and a card (56) held thereby along a path (58) such as to pass the encoded portion (22) of said card through the reader (2) and to establish a data transmission interface (42) between the terminal and the keyboard unit.

3. A terminal according to Claim 2, characterized in that the interface (42) comprises two optoelectronic transmitter/receiver pairs (62, 64, 66, 68).

4. A terminal according to Claim 1, characterized in that the portable keyboard unit (32) includes switch means (57) operated by engagement with the unit of a credit card (56) and operative to disable said interface and prevent transfer of data entered into the keyboard unit.

5. A terminal according to Claim 3, characterized in that the control logic (38) and memory (34) of the keyboard unit (32) are implemented by a microcomputer (70), and said switch (57) is operative on engagement by the credit card (56) to initialize said microcomputer and set up registers in said memory for receipt of data from said keyboard (30).

6. A terminal according to Claim 5, characterized in that said microcomputer (70) is programmed with a data encryption routine operative whilst the unit is engaged with the terminal (44) to encode data stored in at least one of said registers on receipt of an encryption key from said terminal, and to cause said interface (42) to transmit said encoded data to the terminal.

7. A terminal according to Claim 6, characterized in that the terminal (44) includes encryption means (94) responsive to data read by said reader (2) from a card (56) retained in said keyboard unit (32) to generate an encryption key and transmit it to said keyboard unit whilst still engaged with the terminal.

8. A terminal according to Claim 2, characterized in that the means in the portable keyboard unit (32) to engage a credit card is a slot (54) in a wall thereof, and

the terminal (44) comprises a track (58) along which that
wall of the keyboard unit can be advanced in a defined
direction, with a slit (60) in that track to receive the
encoded portion (22) of the card, the reader (2) being
located beneath the slit, one optoelectronic transmitter/
receiver pair (66,68) being located at an end of the
track (58) facing the direction of advance of the key-
board unit, and the other transmitter/receiver pair (62,
64) being located in alignment with said one pair in a
wall of the keyboard unit (32) facing said end of the
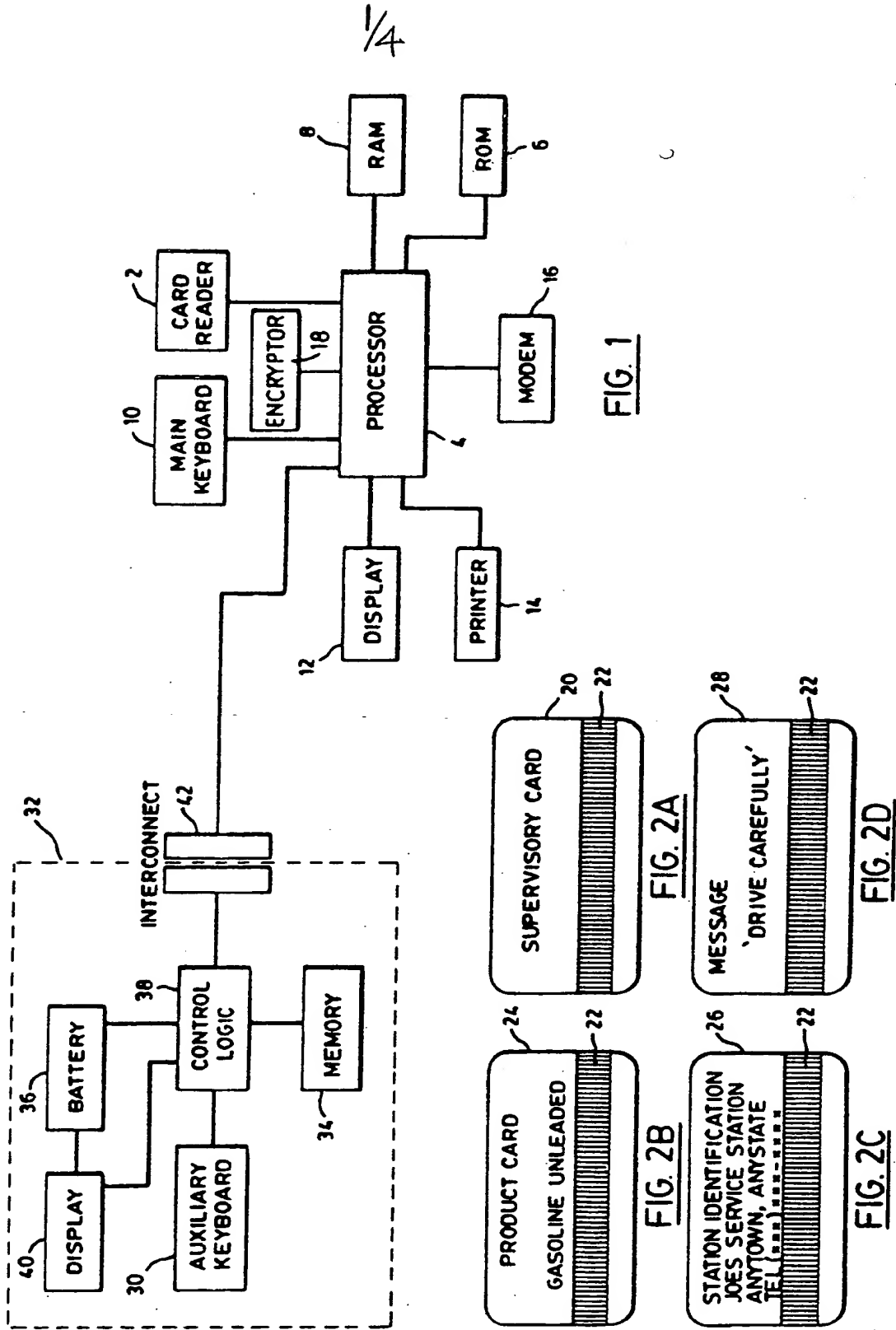track.

9.   A terminal according to Claim 8, characterized in
that it includes a supervisory card (20) engageable with
the keyboard unit (32) and the keyboard unit (32) includes
means (72) to transmit an identification signal to the
terminal (44), the supervisory card (20) carrying data
which when read by the reader (2) places the terminal
(44) in a supervisory mode in which it reads the identi-
fication signal of the keyboard unit (32) and logs it as
a unit from which it may accept data.

10.   A portable keyboard unit engageable with a trans-
action terminal to enter data therein, comprising a body,
a keyboard supported by said body for the entry of data,
means to store data entered by said keyboard, and means
to transfer data from said store to said terminal when
engaged therewith, characterized in that it further com-
prises means (54) to hold a credit card (56) having an
encoded portion (22) such that said encoded portion will
be presented to a credit card reader (2) in said transac-
tion terminal (44) when the keyboard unit is engaged
therewith.

11.   A keyboard unit according to Claim 10, characterized
in that it includes means (57) to enable said data stor-
age means and said data transfer means only responsive

to engagement of a credit card (56) with said keyboard
unit (32).

12. A keyboard unit according to Claim 11, characterized
in that it includes means (70) to encrypt data to be
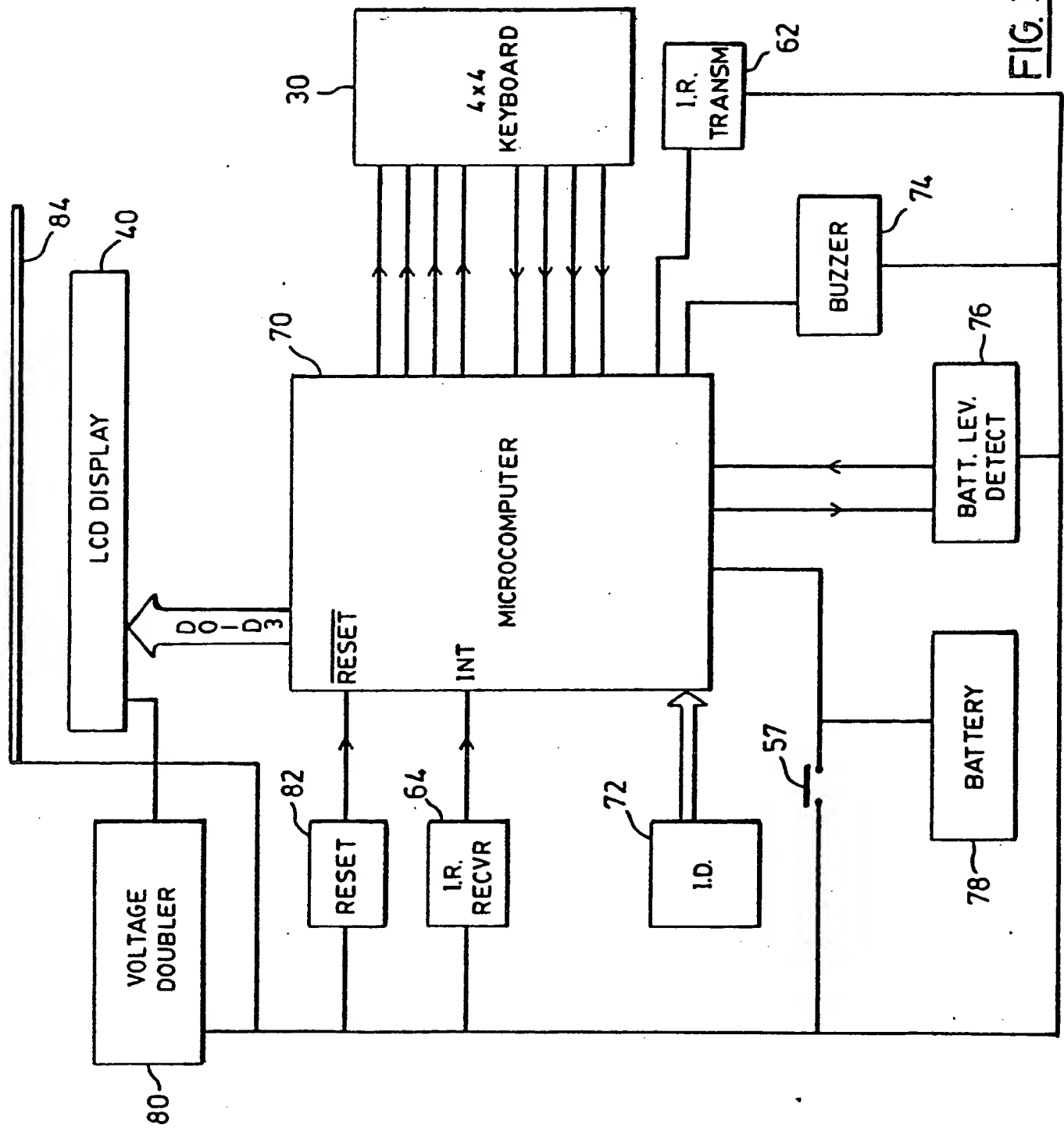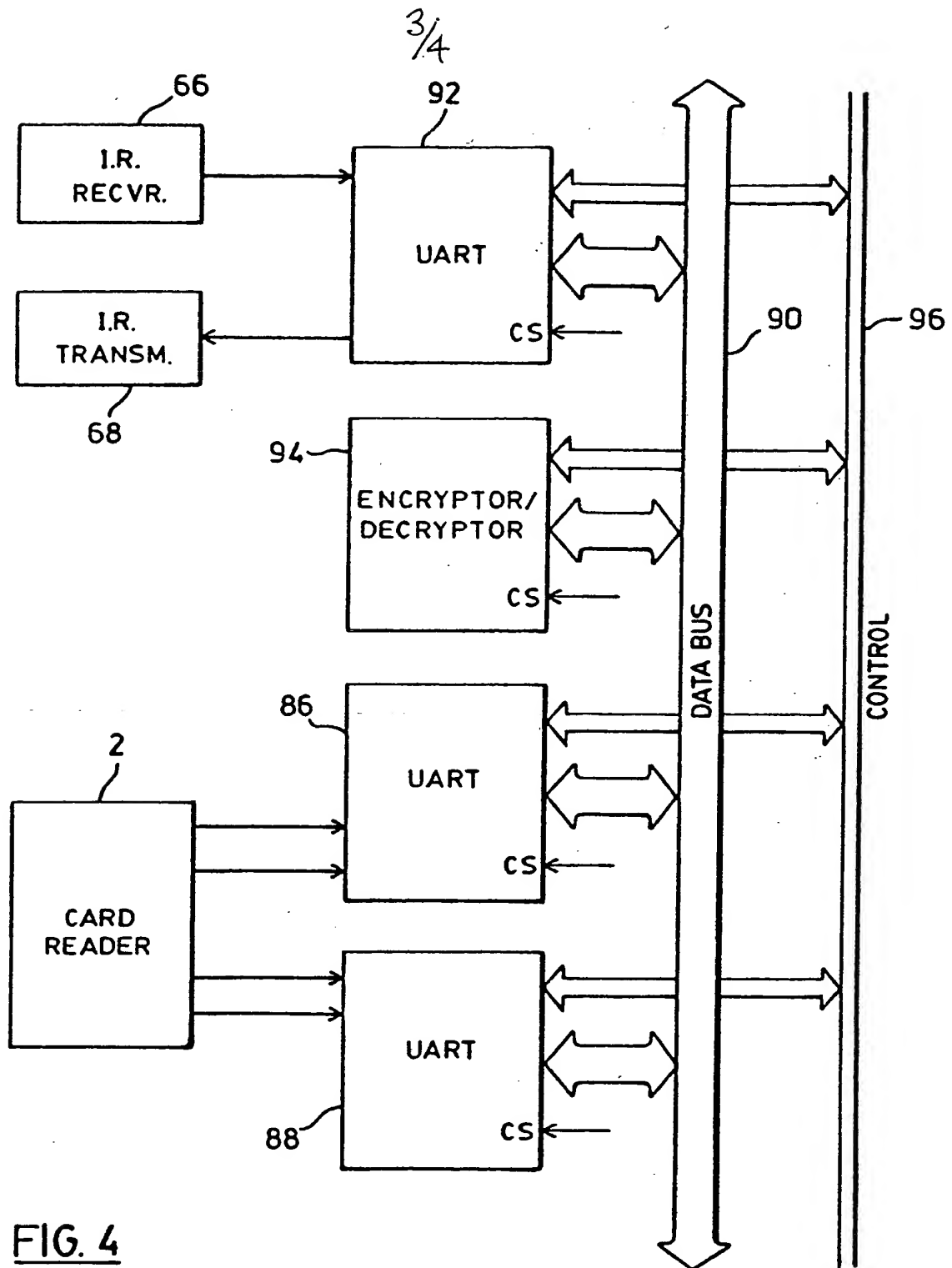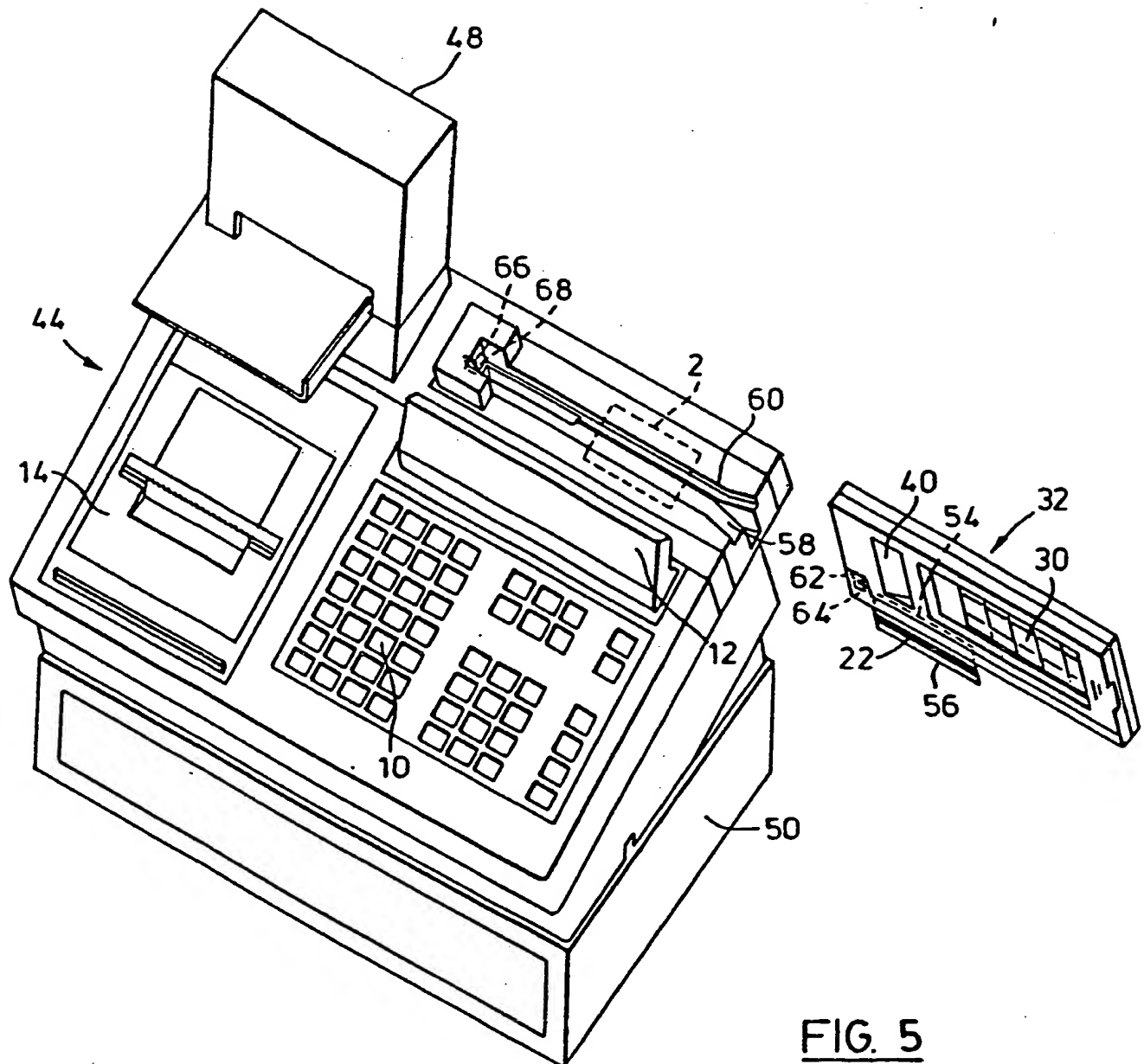transferred by said data transfer means (42).

FIG. 1

FIG. 2A
SUPERVISORY CARD

FIG. 2B
PRODUCT CARD
GASOLINE UNLEADED

FIG. 2C
STATION IDENTIFICATION
JOES SERVICE STATION
ANYTOWN, ANYSTATE
TEL(nnn)nnn-nnnn

FIG. 2D
MESSAGE
'DRIVE CAREFULLY'

FIG. 3

FIG. 4

FIG. 5